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Evaluated were the role and importance of request-receiver feedback in an information system. Participants were 50 university biological scientists who agreed to place requests for information by telephone with a specially established clearinghouse. One type of receiver was a scientist holding a Ph.D. in biochemistry, with over 20 years biological research experience. He interacted with the requester, providing "technical" and "conventional" feedback. The other receiver was represented by a tape-recorder which recorded the call but was unable to provide feedback. A schedule was provided to participants each week indicating the type of answering service which would be available. The requesting behavior of participants with the two types of request-receivers was analyzed. Results indicated that (1) three out of four scientists made exclusive use of the scientist receiver, while one in five used the tape-receiver exclusively, (2) the main objection raised against the tape-receiver was lack of feedback, (3) the tape method was generally used to place brief well-articulated requests, or less difficult requests, and (4) aid in structuring requests as well as mere confirmation responses seemed to be valuable services. A complete description of the operation is given, and the need for request-receiver feedback capability in an information clearinghouse is discussed. (DS)

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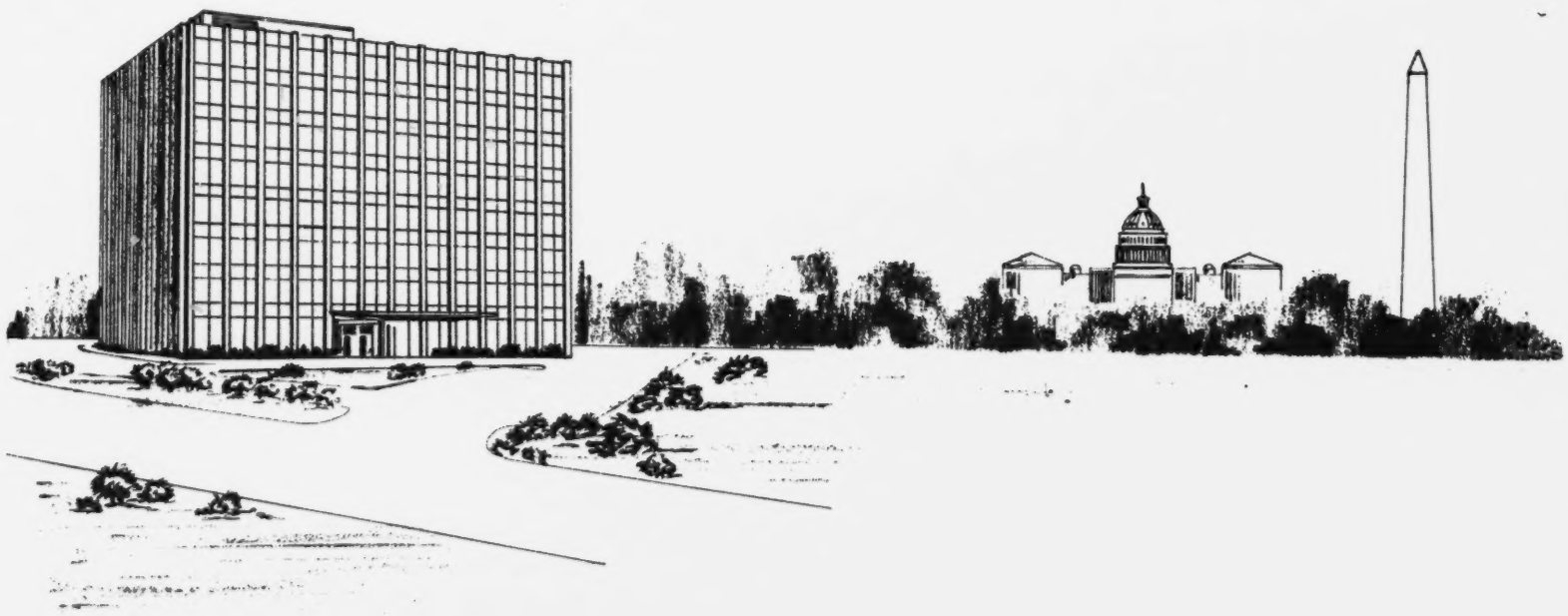

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ABSTRACT

The research described in this report was undertaken to evaluate the role and importance of request-receiver feedback in an information system. A sample of biological scientists in the Washington, D. C. area was selected and invited to place requests for information by telephone with a specially established clearinghouse. Fifty biological scientists working at universities in the area registered to participate.

The requesting behavior of participants with two types of request-receivers was studied. One type of receiver was represented by a scientist holding a Ph. D. degree in biochemistry, with over 20 years of biological research experience. He interacted with the requester, providing "technical" and "conversational" feedback. The other receiver was represented by a tape-recorder which recorded the call but was unable to provide feedback. A schedule was sent to participating scientists each week during the five-week study period, indicating which type of answering service would be available mornings and afternoons during the week.

Each incoming call was tape-recorded; requests made during a call were later transcribed, interpreted and/or modified as necessary, and summarized. Each summarized request was analyzed by a search-strategist (a librarian with a B. S. degree in biology) who decided which available source to use in filling the request. Information obtained was logged in and delivered to the requester by messenger along with a Scientist Evaluation Sheet. Appraisals of clearinghouse operation were obtained from user responses to these question sheets and during periodic, brief, informal interviews.

The report describes participant use of the clearinghouse in terms of type of answering service used, request load (e. g., volume of requests,

frequency of daily requests per week of operation, number of requests transmitted per call), and request content (i. e., document request or bibliographic search request). Three out of four scientists who placed calls made exclusive use of the scientist-receiver, while one in five used the tape-receiver exclusively. The main objection expressed by scientists to use of a recorder-receiver was with the lack of feedback; this lack of feedback apparently discouraged a good number of requests. Participants generally used the tape method to place brief and well-articulated requests or less difficult requests. The preference shown for a scientist-receiver, regardless of the type of request, and the need for a request-receiver with feedback capability in an information clearinghouse are discussed. Aid in "structuring" requests as well as mere confirmation responses provided by a scientist-receiver seemed to be valuable services.

INTRODUCTION

Recent advances in the computer and information sciences have increased the possibility that scientists will soon be able to have their needs for information satisfied with greater speed, detail, and efficiency than ever before. Microstorage, nanosecond search, remote consoles, sophisticated inquiry programs and communication networks could put the entire body of scientific information at the scientists' fingertips, (Cosati, 1965; CUADRA, 1967; & Schecter, 1967). However, to take full advantage of this capability, scientists must interact with the information system. They must translate their felt need for information, what has been termed their visceral need, into a formal request and this they must transmit to an information system (Taylor, 1962).

A previous study (Kinkade, Bedarf & Van Cott, 1967) using a special information clearinghouse where scientists could place requests for information by telephone evaluated advantages of response by a trained biologist over those given by a receptionist (type of receiver). Results showed that scientists preferred other scientists when their requests were not well-formulated and structured. A special information clearinghouse was established and a group of biological scientists were invited to use it to satisfy their informational needs. The participating scientists could place their requests by telephone and they were told which request-receiver type would be available to answer at different times of the day. The results showed that the requesting scientists were highly selective when their requests were not well-formulated and structured. They preferred to place this kind of request with the scientist-receiver. However, the requesting scientists did place requests with the receptionist-receiver.

One of the features of both types of receivers was that feedback was supplied directly to the scientists as they were making their

requests. Although only the scientist-receiver was able to supply technical feedback in terms of the clarity of the request and the need for additional descriptors, both receiver types supplied what has been termed conversational feedback. While receiving the requests, both types of receivers said, "Yes", "Umm", "Would you repeat that", etc., at periodic intervals.

How important is this feedback feature in the design of a request-receiver component? Will biological scientists use a system if the system does not indicate that it has received and has understood the request? Does this feedback feature help the requesting scientists formulate their requests even though the feedback is non-technical in nature? Will the requesting scientists change their request format if this feedback feature is absent? The research described in this report was undertaken to supply answers to some of these questions.

The approach adopted to evaluate the importance of a feedback feature in the request-receiver component was similar to that used in the previously cited study. A special information clearinghouse was established and biological scientists were invited to telephone their requests for information to it. Two request-receiver types were evaluated. One type was represented by a trained experienced biological scientist, and the other was represented by a tape-recorder. The recorder-receiver gave no feedback to the requesting scientists, but only recorded their requests. The scientist-receiver provided both "technical" and "conversational" feedback. The requesting scientists were told that their requests would be received by these two types of receivers and they were given a schedule that showed when each type would be receiving calls. It was hypothesized that (1) the scientists would use the recorder-receiver only for very specific, well-formulated requests, (2) the scientists would show a strong preference for the scientist-receiver, even when their requests were very specific,and (3) the scientists would have difficulty in formulating even specific requests when they contacted the recorder-receiver.

METHOD

Research Setting. The study was conducted in the Washington, D. C. area at the Federation of American Societies for Experimental Biology at 9650 Wisconsin Avenue, Bethesda, Maryland. While the activities of the people of the clearinghouse were somewhat different from the principal activities of other members of the Federation, a spirit of cooperation and interchange did exist between the two groups of personnel, and because of the reservoir of scientific knowledge at the Federation, the clearinghouse was able to be more responsive to a wider variety of requests than otherwise would have been possible.

Subjects. Biological scientists working at three universities in the Washington area were solicited. Participants in a previous study were asked for names of potential participants. Candidates were then contacted personally and asked to participate. Those willing to do so were asked to sign a statement indicating an awareness that their conversation would be recorded when they called the Clearinghouse. Fifty agreed to participate in the present study.

Forty-six of these had participated in the preceeding study and 15 of these had taken part in the study prior to that. An additional subject was added during the present study.

Procedure. Participating scientists were notified by mail several days before the beginning of the clearinghouse operation as to when service was to start. Thereafter, a weekly notice was sent to each, confirming the continuation of the operation and giving the answering service schedule. During the mornings (9 a.m. - 12 noon) of the first, third, and fifth weeks, and the afternoons (1 p.m. - 4 p.m.) of the second and fourth weeks of the clearinghouse's operation, calls were received by a tape answering system. The caller had been

instructed by letter that when calling during these time periods, a tape recording would be made of his request. He was instructed to wait until the telephone ringing had ceased and then to speak. No communication was returned to him from the clearinghouse, however. The afternoons of the first, third, and fifth weeks, and the mornings of the second and forth weeks of the clearinghouse's operation, requests were received by one of two trained, experienced biological scientists, each holding a Ph. D. degree in biochemistry and having over twenty years of biological research experience. The Request Receiver's task was to assure that an understandable, processable request was made with as little interaction with the requesters as possible. Interaction in the form of questions or the repetition of phrases to the requester, occurred primarily when the requests were not processable as stated or when some degree of confirmation from the scientist was necessary. All of the requests were tape recorded.

Each call was next processed by the Request Processor. Both biological scientists served in this capacity. This entailed listening to the taped recording of the call and transcribing each request made during the call. The Request Processor would, when necessary, interpret the requests, adding descriptors or placing necessary constraints on requests in order to allow for more effective searching.

The summarized requests, as interpreted by the request-processor, were then given to a search-strategist, who was a highly qualified librarian with a Bachelor of Science degree in biology. The search-strategist decided how the requests were to be filled and supplied any additional descriptors or constraints not included in the original requests. In some cases, a request could be filled by obtaining a copy of an article; in other cases, a literature search was required. In either case, the search-strategist had to decide which of several available sources to use for filling the requests.

When the requests involved searching for information, the summarized requests were given to an information-searcher, along with any additional descriptors supplied by the search-strategist. Three information-searchers were employed on a part-time basis, their tasks being to locate required information by using existing library facilities.

When the information needed to fill a request was obtained by the clearinghouse, it was logged in and then delivered to the requesting scientist by messenger. Accompanying each document sent to the scientist was a Scientist Evaluation Sheet, containing four questions. The first question concerned the document's responsiveness to the scientist's request. The second question concerned possible additional information needs of the scientist resulting from the product supplied by the clearinghouse. The third concerned the acceptability of the time delay needed to fill the request. The fourth question asked for an over-all evaluation of the service in light of that particular request.

The participating scientists were interviewed periodically. In general, these interviews were brief and rather informal. The purpose was to obtain insights and evaluations from scientists concerning the clearinghouse's operation and to ascertain whether or not the participating scientists actually consulted the request-receiver's schedule. The complete cycle of the clearinghouse's operation is illustrated in Figure 1.

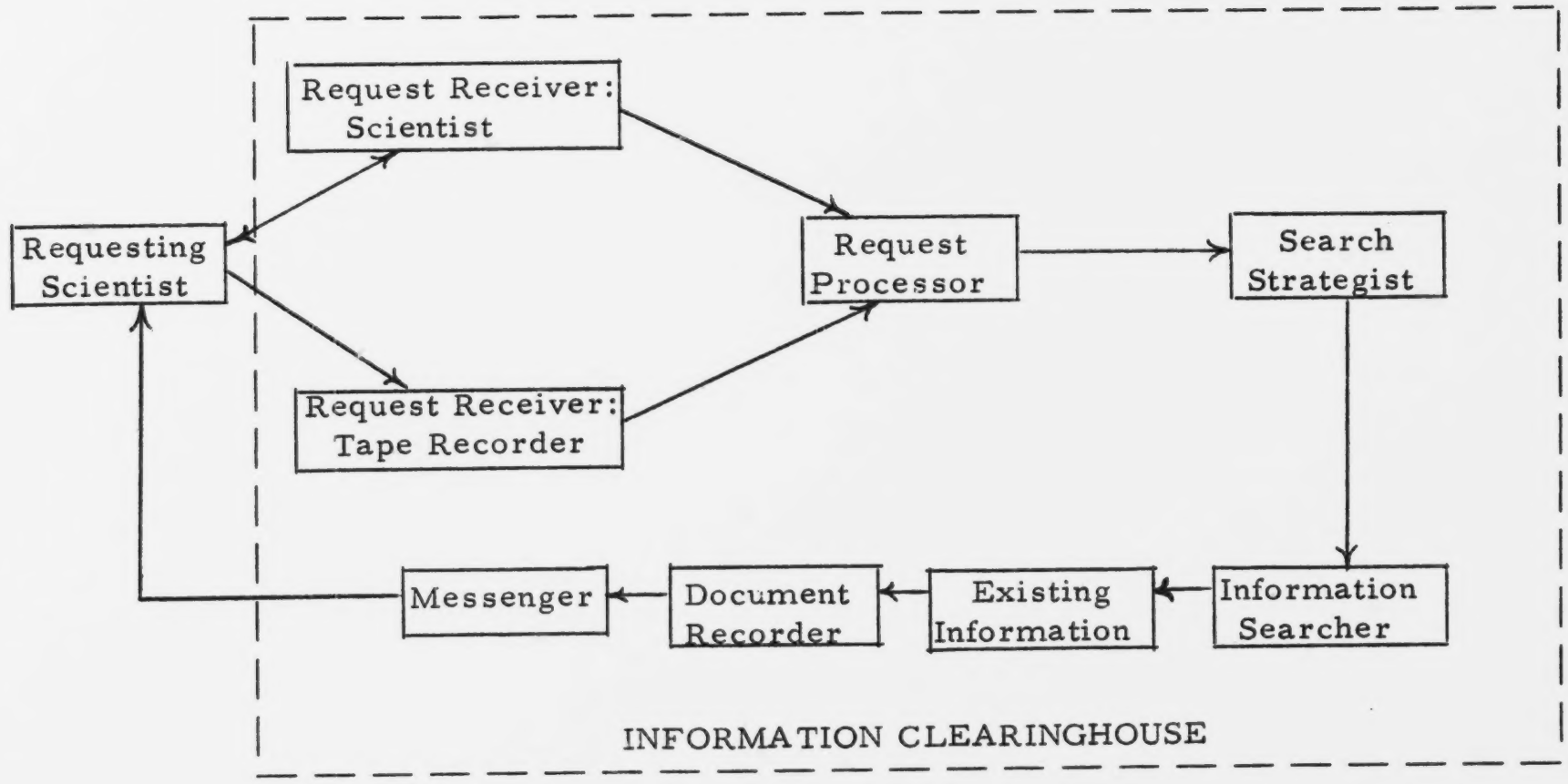

Figure 1. Representation of the FASEB Information Clearinghouse System for the Scientist/Tape Study

RESULTS

The evaluation was conducted primarily in terms of scientists requesting behavior. The results are presented under four headings. The first section deals with a description of the general participation of the scientists. The second section describes the Request Load, i. e., how many requests were made, when requests were made, and how many requests were made at one time. Request Content, i. e., what was asked for, is handled in the third section. The final section contains the Scientists' Evaluation of the clearinghouse.

A call was counted when contact was made by one of the requesting scientists to the clearinghouse. A request was any statement made by a scientist during a call to which the system could respond with a document. If several journal articles were requested during a call, each of these was considered as a separate request. An inquiry for information on a given topic which resulted in a bibliographic search was also treated as a request.

Participation. About 2/3 of the registered scientists actually placed calls to the clearinghouse. Of these, about 3/4 made exclusive use of the scientist-receiver whereas only 1/5 used the recorder-receiver exclusively, leaving about 1/10 of the scientists who used both types of request-receivers. The requesting scientists who used both types of request-receivers were the heaviest clearinghouse users. The requesting scientists placed a total of 45 calls to the clearinghouse during the five week period. A little less than 2/3 of these calls were directed to the scientist-receiver. At the beginning of the five week period, calls to both types of receivers were made at approximately the same rate. As the clearinghouse operation continued, the calls to the recorder-receiver tended to decline while those to the scientist-receiver occurred at roughly the same rate. After about three weeks

the number of calls to the scientist tended to decline. Figure 2 illustrates the cumulative number of calls to each receiver type as a function of days of operation. The range of calls per scientist, placed to each of the receiver types was the same (1 to 4 calls per scientist).

Request Load. A total of 100 requests was made during this study. About three-fourths of these were placed to the scientist-receiver. Figure 3 compares the average number of requests per day for each receiver type as a function of the week of operation. The number of requests to both receiver types is shown to have decreased as the study progressed.

The range of requests per call to the recorder was from 1 to 4 and to the scientist it was from 1 to 10. The average number of requests per call was 2.52 to the scientist-receiver and 1.69 to the tape-receiver.

Request Content. Requests were placed in two categories. Those requests which required a copy of an article were termed document requests. Requests which required a search of the literature for references on a given topic were labeled bibliographic search requests. Seventy-three percent of all requests were for bibliographic searches. One way of evaluating the use of the two types of request-receivers with respect to these two categories is through conditional probabilities. Given that a requesting scientist wishes to have a bibliographic search made, what is the probability that he will call his request in to the scientist-receiver system? The data reveal that this probability is .64. Thus, the probability that the recorder-receiver system will be used is .36. Should the scientist have need for a document the probability of calling the scientist-receiver is .66 and the recorder-receiver, .34.

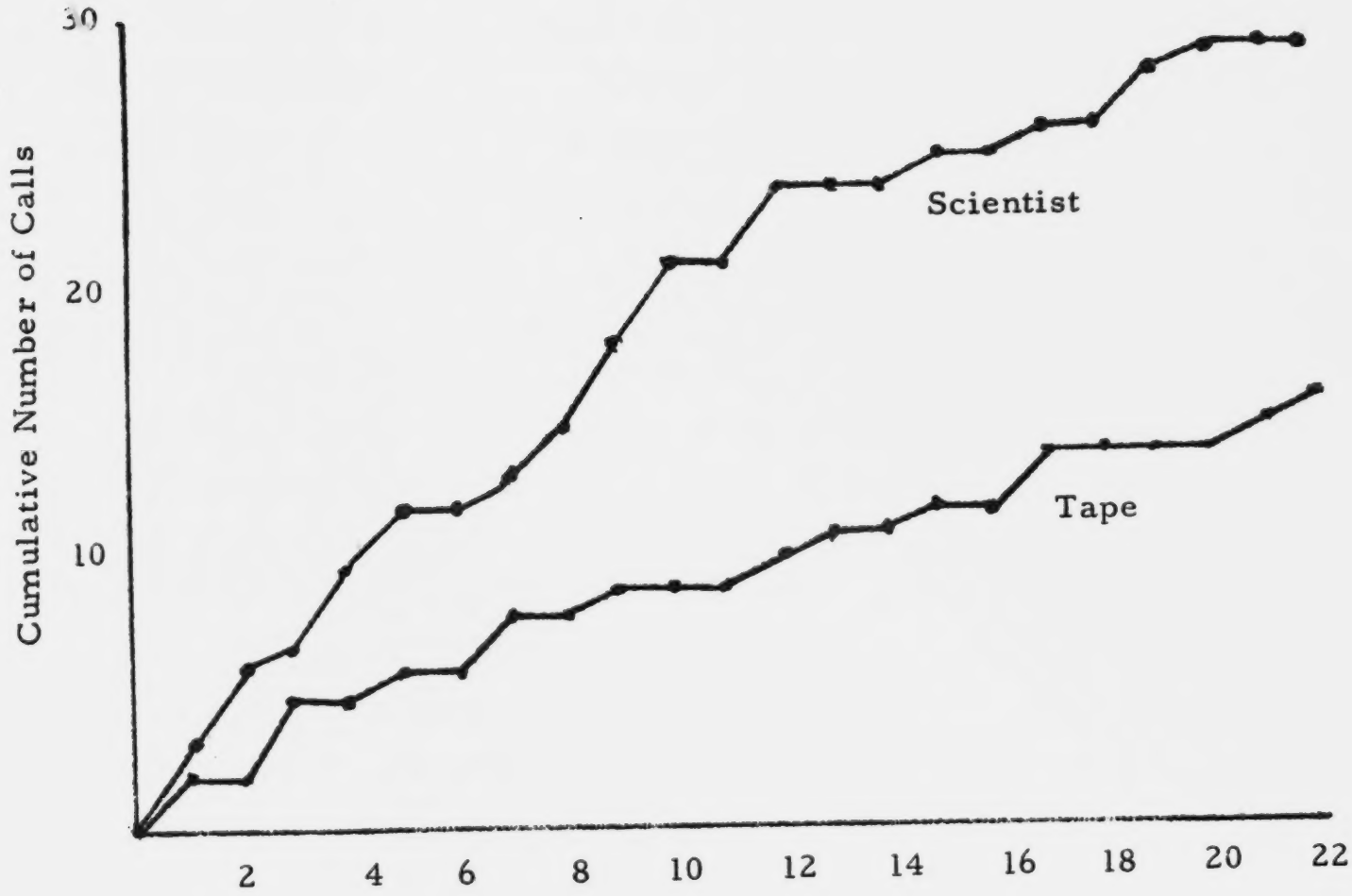

Figure 2. The cumulative number of calls to each receiver as a function of days of operation.

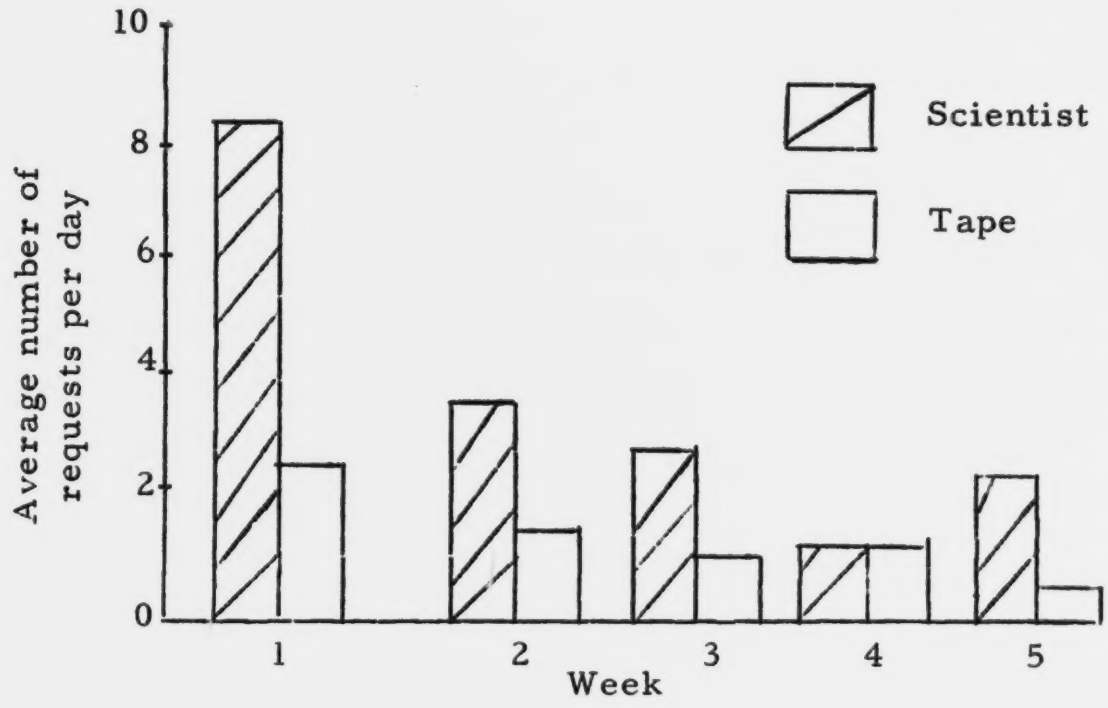

Figure 3 The average number of requests per day placed with each receiver type as a function of the week of operation.

Scientists' Evaluation. The participating scientists were given the opportunity to evaluate the two types of Request Receivers through a terminal interview or debriefing which took place within 10 days of the close of the clearinghouse operation. With respect to the request receiver schedule, about 2/3 of the scientists said they attended to the schedule when they received it. About 1/2 said they called specifically when the scientist-receiver was on duty. When questioned as to whether they made (or would make) different types of requests of the two systems, about 1/2 said that they would. Most of these felt that only simple requests, requests for articles and requests containing key words should be made of an automatic system. The scientist-receiver was to be reserved for complex requests requiring much detailed explanation. Of the scientists who placed calls to the recorder-receiver, 2/3 expressed some difficulty or uneasiness while doing so. The chief

complaint was that since there was no feedback, they were not sure that their requests were being received. Questioned as to any difference required in request format, between the two systems, about 1/3 believed that there was some difference involved. The scientists stated that there was more preparation and less talking involved in making a request of the recorder. Requests placed to the recorder-receiver had to be more precise and, in their opinion, required greater use of key words.

DISCUSSION

Participation. The fact that significantly more participants made exclusive use of the scientist-receiver than of the tape-receiver suggests some planning by the participants.

Although the total number of calls to each receiver did not differ significantly, there appears to be some difference in the rate at which calls were made. The use of the tape-receiver appears to be more continuous although at a lower rate than that of the scientist-receiver. This rate difference does not seem to suggest the emergence of a trend.

Request Load. There is a significant indication here that the scientist-receiver was overwhelmingly preferred in the placement of requests. This is also indicated by the fact that the scientist also handled a greater number (although not significantly so) of requests per call than the tape-receiver. This greater number is, in general, reflected throughout the time period. This means that there are no serious interactive effects between the type of receiver and the various temporal categories of the study.

It is evident from the scientists' actual behavior and from the interviews, that the tape-receiver system poses some problems to the scientists. The main objection is in lack of feedback. An absence of confirmation causes uncertainty as to whether the message has been received. These findings are in agreement with Leavitt and Mueller (1955) who also found that feedback increases the accuracy of information transmitted, increases confidence of transmission, and that lack of feedback creates hostility.

Request Content. The scientist has to work harder when addressing the tape system. He has to be more structured and must assume more of the responsibility for errors which may result during

processing. Some calls to the clearinghouse were made with the idea that immediate aid could be given even if only in the form of helping the requester to structure his request. In these cases, the scientist-receiver served a valuable purpose. There is a suggestion here that a tape system can be adequately used when a request is for a document. Actual performance, however, does not bear this out. The conditional probabilities show that regardless of the type of request, the scientist is more likely to be called.

The apparent uneasiness which is associated with calling the tape system can be overcome. Several scientists who called the tape system expressed no great difficulty. This, however, may be associated with the fact that these individuals had fairly structured requests, or took the time to organize their requests. Perhaps, the tape system provides an excellent opportunity for the scientist to learn to be more exact in making his requests.

Processing of tape-received calls was more rapid and less difficult. This is not to say that the tape system was in any way superior in receiving calls. It is, perhaps, more adequate to say, in view of the other findings, that the tape system was used by the requesters to place less difficult requests or requests which were clear and short.

Scientists' Evaluation. The verbal report of the participants seemed to coincide with their use of the clearinghouse facilities. Of those who stated they specifically called the scientist-receiver system, many expressed the feeling that they needed to talk to a human voice. It also appeared that they were using the scientist as a colleague, in a sense, since they could be fairly unstructured in making requests and often felt they benefited from the scientist-receiver's "structuring."

SUMMARY AND IMPLICATIONS

The Request Receiver role of an information clearinghouse has been investigated with respect to the need for a feedback capability within that role. Since the Request Receiver is the interfacing component between the requester and the rest of the clearinghouse, this capability may seriously affect the eventual end product. This need was evaluated by means of observing scientists' requesting behavior when either a trained scientist or a tape-answering system with no feedback was used as the Request Receiver.

Regardless of type of request, there was a greater probability that the scientist would place his request with the scientist-receiver. The lack of feedback in using the tape system apparently discouraged a good number of requests. Participants generally seem to need confirmation of reception and structuring as provided by the scientist-receiver.

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